MITSUBISHI ELECTRIC

Changes for the Better

for a greener tomorrow eco Changes

Energy Measuring Unit

EcoMonitor Light

Simple & Easier

Providing Energy Visualization

EcoMonitor Light

Simple & Easier
Providing Energy Visualization.

Introducing the EcoMonitorLight, an energy measuring unit with an integrated display that provides easy energy visualization in order to provide ways to save energy and to comply with the Energy Saving Act in response to the need for a simple manner to figure out energy consumption.

EMU4-BD1-MB

The EcoMonitorLight is suitable if you are thinking

Just want to measure energy in a simple low-cost manner.

The integrated display allows you to perform the main unit settings and check measured values quickly. A general-purpose cable can be used making it unnecessary to select troublesome equipment considering cable length.

Considering system expansion in the future. But is this product okay for now?

First, start from checking conditions in locations you are concerned about. It is possible to expand later to data logging and networks (CC-Link communication) step by step.

EcoMonitor Light

EMU4-HD1-MB

about the following.

Want to easily manage measurement data from specific locations.

We can provide you with free software for managing data using a personal computer. You can also link up with an upper-level system by using MODBUS® RTU (RS485) communication.

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1 Easy and Low-Cost Measurement

■Simple Measurement/Installation

The built-in LCD screen enables the settings, measurements, and displays required for measuring energy with a single unit.

■Product Lineup that Provides Easy Equipment Selection

This measuring unit lineup consists of a "High Performance Model" and a "Standard Model".

① High Performance Model: For customers who want to perform harmonic measurements, alarm monitoring, upper/lower limits monitoring, alarm output and pulse input/output, in addition to the Standard Model features

② Standard Model: For customers who "want to start measuring energy in a simple and low-cost manner".

■Specialized Cable is Not Required

You can use a general-purpose cable between the measuring unit and split current sensor!
Cost can be reduced because no specialized cable is required.

* EMU2-CB-Q5B(-4W) is necessary if using a split 5A current sensor.
* Refer to “Wiring Precautions” on p. 26 for information about general-purpose cables.

High Performance Model

- 440V direct input (Three-phase 3-wire compatible)
- 277V/480V direct input (Three-phase 4-wire compatible)
- Measures harmonic current, voltage, etc.
- Pulse input/output
- Contact input/output

EMU4-HD1-MB
High Performance Model

Standard Model

You can measure all types of energy including power use, voltage and current.

Displayed on main unit of measuring unit.

You can use the front panel operating switches to specify settings and change the display.

EMU4-BD1-MB
Standard Model

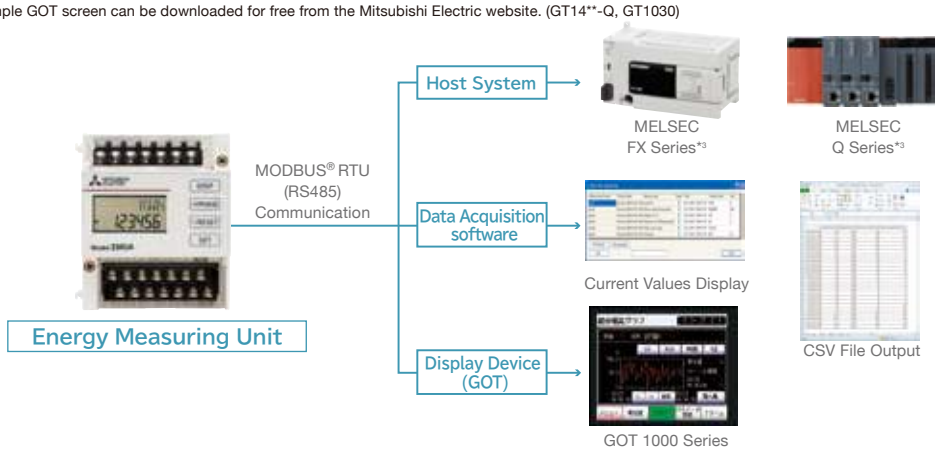
2 MODBUS®RTU(RS485)Communication as Standard Equipment

Providing MODBUS® RTU (RS485) communication as standard equipment allows you to connect with the functions listed below, and use it for energy management and as a system terminal.

①Host systems (such as PLC, etc.)
②Data Acquisition Software (EMU4-SW1)*1
③Display device (GOT)*2

to Special Applications on p.11

*1: Data Acquisition Software (EMU4-SW1) can be downloaded for free from the Mitsubishi Electric website.
*2: A sample GOT screen can be downloaded for free from the Mitsubishi Electric website. (GT14**-Q, GT1030)



*3: A unit compatible with MODBUS® RTU (RS485) communication is required if connecting with a PLC.

3 Expansion by use of Logging and Communication Units

■Logging Unit

Use of a logging unit allows you to output various energy(such as current, voltage and power)data measured using the energy measuring unit in CSV file format on an SD memory card for easy data management.

■Communication Unit (CC-Link Communication Unit)

A communication unit can be connected to the system using CC-Link communication.

Logging Unit

CSV Data

The logging unit stores measurement data for a specified period and outputs it to an SD memory card.*1

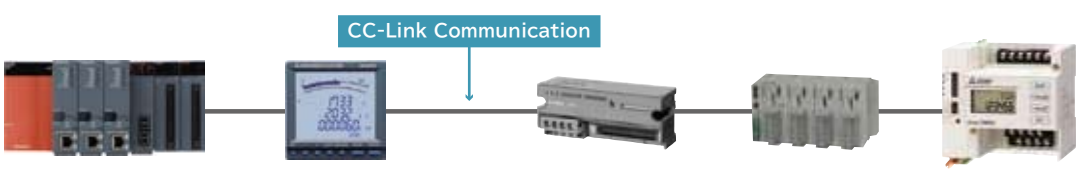
Even data from multiple energy measuring units can be managed on a single SD memory card.*2

Examples of CSV data screens

*1: The data retention period of the logging unit is limited.
*2: It is necessary to always specify logging ID when collecting measurement data from multiple logging units on a single SD memory card. Refer to the operation manual for details.

Communication Unit

CC-Link Communication



MELSEC-Q Series*3

Electroronic Multi-Measuring Instrument

Remote I/O Unit (CC-Link Communication)

EcoMonitorPro

Energy Measuring Unit + CC-Link Communication Unit

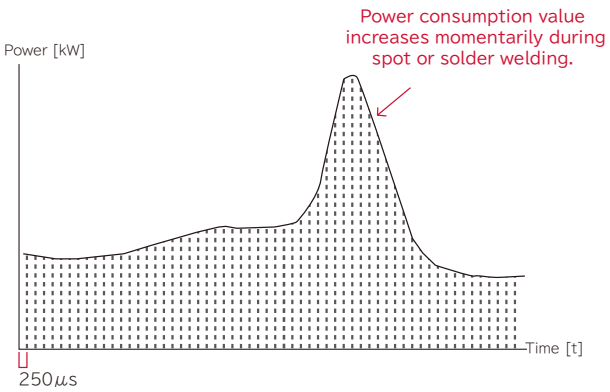
*3: Units compatible with each communication method are necessary if connecting a PLC.

4 Measurement Functions

■High-Precision Measurement

The continuous measurement of energy at sampling cycles of approximately 250 μs allows for measuring even short-cycle loads such as that for spot or solder welding.

*Data of measured values, including power use as well as voltage, current and similar items, is acquired at update cycles of 250 ms.



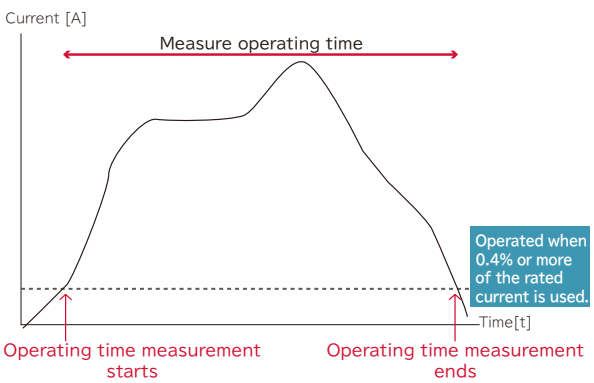
Advantage of High-Precision (Short-Cycle) Measurement

It is possible for measurements to be missed when performing continuous measurement of short-cycle loads because the power used for spot or solder welding is used for an extremely short period. The EcoMonitorLight provide high-precision measurement so that the measurements of short-cycle loads are not missed.

■Operating Time Measurement

The current measurement time can be calculated in seconds and the equipment operating time can be displayed in hours (h) in order to utilize the data in diagnosing production equipment service life and for performing preventive maintenance.

*Operating time can also be output to the host system as CSV data.



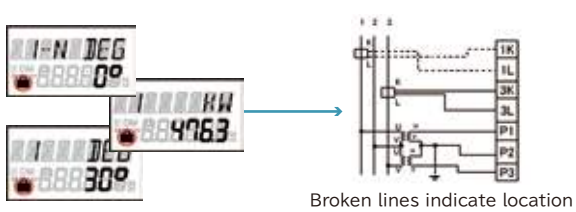
Operating Time Measurement with Specified Inputs as a Trigger

You can specify contact inputs to the energy measuring unit (High Performance Model only) as triggers for the start and end of operating time in order to be able to measure operating time according to actual equipment operation.

5 Support Functions

■Misconnection Support

This function displays items such as current and voltage phase angles, and energy, current and voltage values for each phase. By checking each displayed value, distinction of whether there is a misconnection in current or voltage input used for measuring is supported.



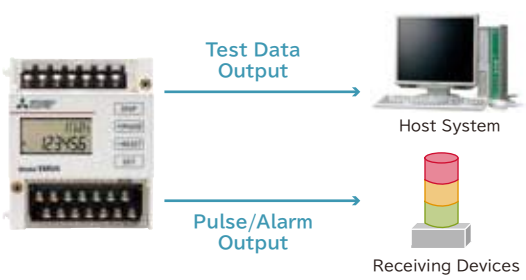
Examples of Display Check Screens

Broken lines indicate location of misconnection.

Example of Misconnection

■Test Function

This function enables communication of test data to the host system without voltage or current input. By enabling alarm and pulse test signal output, it becomes easy to check wiring and perform system testing.



*The above examples are sample images.
Refer to the operation manual for actual screens, the check method, directions for use, etc.
*Refer to the operation manual for the table for distinction.

6 Compliance with Foreign Standards

Devices correspond to the international standards of CE marking, UL*, and KC Marking,
and also meet the compliance demands for standards for embedded applications in overseas equipment.

*Please contact your nearest Mitsubishi Electric branch office or representative for information regarding the standards compliance status of each model.

★Correspondence from production in February 2014.（Except for some models）

★UL/c-UL is certified only for the following conditions.

Item			Specifications			
Model			EMU4-HD1-MB		EMU4-BD1-MB	
Nominal System Voltage	Measuring circuit	single-phase 2-wire three-phase 3-wire	120V, 240V AC		120V , 240V AC	
		single-phase 3-wire	120V AC (b/w 1- and 2-side, 2- and 3-side), 240V AC (b/w 1- and 3-side)		120V AC (b/w 1- and 2-side, 2- and 3-side), 240V AC (b/w 1- and 3-side)	
		three-phase 4-wire	208Y/120V AC		Non-compliant	
Auxiliary power supply rating			100-240V AC (+10%, -15%),50Hz/60Hz, 10VA, Transient Overvoltage : 1,500V			
Transient Overvoltage			Measuring circuit : CAT Ⅲ, Auxiliary power supply : CAT Ⅱ			
Possible combination current sensor			EMU-CT50/100/250,EMU2-CT5-4W		EMU-CT50/100/250,EMU2-CT5	
Possible combination optional unit			EMU4-CM-C ※1	EMU4-LM ※2	EMU4-CM-C ※1	EMU4-LM ※2

※1 EMU4-CM-C enables to transfer measured data to programmable controllers for data acquisition via CC-Link communication.

※2 EMU4-LM enables to memorize the data of various quantities related to electricity for a certain period.

Energy Measuring Unit

*Photos are full-scale.

The lineup consists of two types of measuring unit to make it simpler to easily visualize energy consumption.

EMU4-HD1-MB

EMU4-BD1-MB

High Performance Model

EMU4-HD1-MB

For customers who need more advanced functions than those of the standard model such as three-phase 4-wire measurement, pulse count and contact input!

①Same basic functions as the Standard Model.
②Three-phase 3-wire 440V direct voltage input is available.
③Three-phase 4-wire 277V/480V direct voltage input is available.
④Able to display harmonic current and voltage, apparent power, power consumption and CO_2 conversion.
⑤Equipped with pulse and contact input/output functions.

Product	Energy Measuring Unit [High Performance Model]
Model	EMU4-HD1-MB

Standard Model

EMU4-BD1-MB

For customers who want to start measuring energy in a simple and low-cost manner!

①Equipped with basic energy measurement functions such as for current, voltage, power and electric energy.
②Standard-equipped with MODBUS®RTU communication.

Product	Energy Measuring Unit [Standard Model]
Model	EMU4-BD1-MB

Optional Units

*Photos are full-scale.

Logging Unit

For customers who want to easily manage data using SD memory cards!

CC-Link Communication Unit

For customers who want to connect to CC-Link communication!

▶Optional Units

Product	Logging Unit	CC-Link Communication Unit
Model	EMU4-LM	EMU4-CM-C

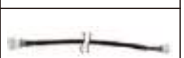
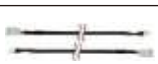
Options

▶Split Current Sensor Cable

Product	Model	External View
Split-type current sensor	EMU-CT50	
	EMU-CT100	
	EMU-CT250	
	EMU-CT400	
	EMU-CT600	
	EMU2-CT5	
	EMU2-CT5-4W	

*In divided split-type Current Sensor (EMU2-CT5 (-4W)) use, EMU2-CB-Q5B (-4W) is needed.

▶Options for 5A Current Sensor (Current Sensor Cable)

Product	Model	External View
5A Current aensor cable	EMU2-CB-Q5B (Single-phase 2-wire, single-phase 3-wire and three-phase 3-wire)	
	EMU2-CB-Q5B-4W (Three-phase 4-wire)	
Extension cable (Standard type)	EMU2-CB-T1M(1m) EMU2-CB-T5M(5m) EMU2-CB-T10M(10m)	
Extension cable (Separate type)	EMU2-CB-T1MS(1m) EMU2-CB-T5MS(5m) EMU2-CB-T10MS(10m)	

▶Options for Logging Unit

Product	Model	External View
SD memory card for logging unit	EMU4-SD2GB	
Lithium battery for logging unit*	EMU4-BT	

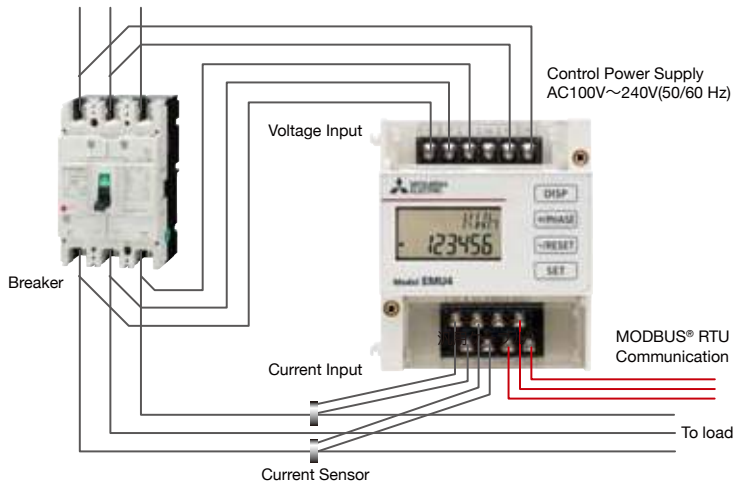
*Logging units include one lithium battery for logging unit when purchased.

▶Panel Mounting Installation Option

Product	Model	External View
Panel mounting attachment	EMU4-PAT	

1 Configuration Example of Measuring Devices

■Basic Installation



○You can use a general-purpose cable between the measuring unit and dedicated split current sensor. (Except for (EMU2-CT5(-4W))

○Always use in combination with a dedicated split current sensor.

○Give consideration to the rated current of the installation location for the dedicated split current sensor and select a model accordingly.

2 Examples of Measuring Unit Application

■Visual checking and management

For customers who want to visually check measured values with distribution boards!

Installation inside a Board

For customers who want to install the unit inside a board for visual management of measured data!

Example of installation inside board

Key Point

Customers visually checking power use with a mechanical Watt-Hour meter can achieve board size reduction and space savings.

*Cannot be used for billing.

Example of Current Sensor Installation

Two split current sensors installed to secondary side of a breaker

*For three-phase 3-wire, Single-phase 3-wire.

Panel Installation

For customers who want to install the display screen on the board surface for monitoring of measurement data.

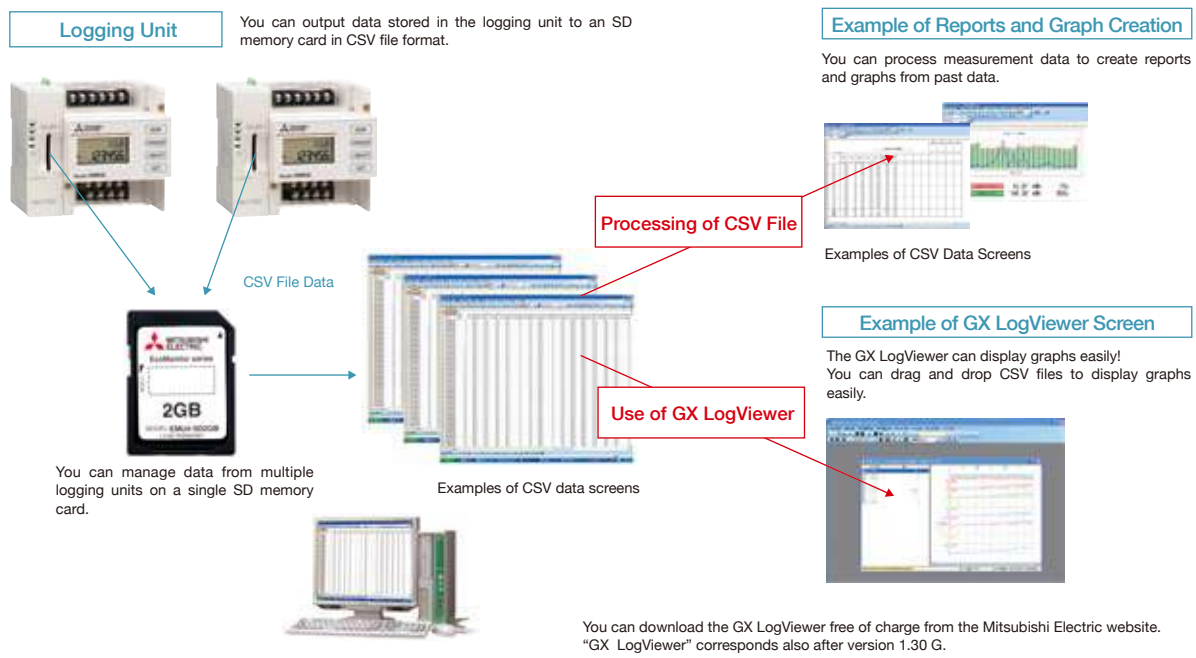
Key Point

If you do not want the board surface installation screws to be exposed in the board surface, you can use the installation attachment (EMU4-PAT) to cover the screws.

3 Example of Logging Unit Applications

■Easy Management of Measurement Data of Measurement Points

For customers who want to periodically collect and easily manage energy measurement data!



Features of Logging Unit

(1) Easy Data Management with SD Memory Card

- You can output various types of measurement data (such as voltage, current and power) of the EcoMonitorLight stored in the logging unit to an SD memory card. The measurement data saved by saving carrying about and CSV data in a single SD memory card at two or more sets of logging units is collectable.
  * It is necessary to always specify logging ID when collecting measurement data from multiple logging units on a single SD memory card. Refer to the operation manual for details.
- The logging unit features a two-step structure in which measurement data is saved for a specified period and output to an SD memory card. This prevents the loss of measurement data and provides secure and reliable data management.

(2) Managing Measurement Data in CSV Format

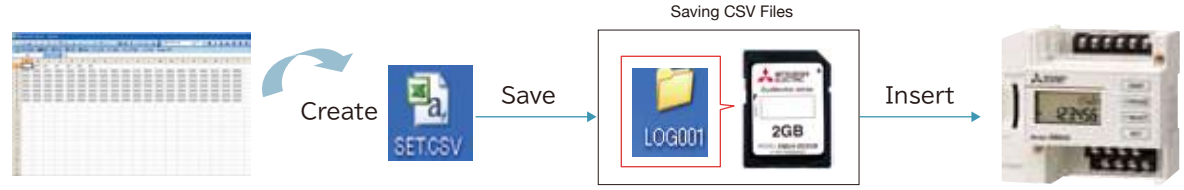
- The logging unit outputs measurement data to an SD memory card in CSV file format. The data can be processed freely using a personal computer in order to create graphs and manage results.
- Measurement data output to an SD memory card can be checked using Microsoft Excel or GX LogViewer (version 1.30G or later)*, and these can be used to display and analyze energy graphs from the data.

(3) Easy Expansion

- Customers already using the EcoMonitorLight can easily add the logging unit.

Logging Settings

Able to freely create CSV file formats freely create CSV file formats by adding setting data files to an SD memory card in advance.



Specify settings such as logging start time, group number and channel number for the specified location in the setting data file (CSV file).

Change the name of the CSV file.

Specify the file name and save to SD memory card*.
*It i necessary for the folder name to match the logging ID of the logging units

Data is logged using the specified format.

4 Examples of Data Acquisition Software (EMU4-SW1) Applications

■For customers who want to perform real-time energy monitoring from remote locations and energy management with a simple data acquisition system structure.

Using Data Acquisition Software EMU4-SW1 + MODBUS®RTU Communication

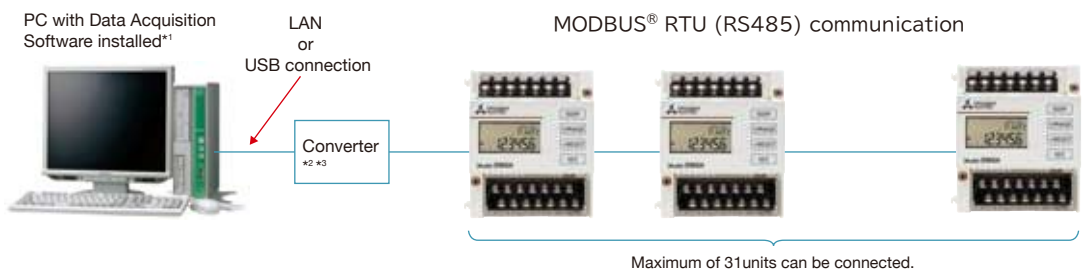
Energy management software (EMU4-SW1) performs data acquisition from energy measuring units equipped with a MODBUS® RTU communication interface.

* Data Acquisition Software (EMU4-SW1) carries out free download, and gets from the "design supportive tool data" of the Mitsubishi Electric site (http://www.MitsubishiElectric.co.jp/haisei/lvs/) energy-saving supporting aircraft machine menu.

Features of the Data Acquisition Software

(1) Capable of collecting a maximum of 124 items of measurement data from measurement devices and displaying corresponding current values.
(2) Capable of logging measurement data in designated cycles. (one minute or one hour)
(3) Logging data is output in Excel format.
(4) You can specify basic settings of energy measuring units connected for communication.

* The above features are some of the main ones of the data collection software (EMU4-SW1). Be sure to refer to the operation manual for details regarding all the features and other functions.



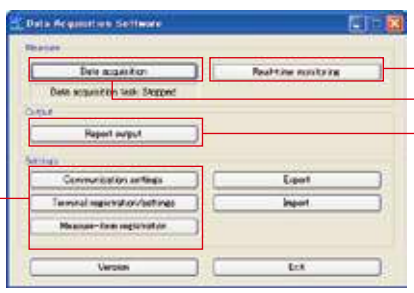
*1: One PC per each system is required.
*2: Converter used can be a LAN⇔RS485 converter or USB⇔485 converter.
*3: Connectable devices: LINEEYE SI-65 (LAN⇔RS485 converter) and LINEEYE SI-35USB (USB⇔485 converter)

Examples of Data Acquisition Software (EMU4-SW1) Display Screens

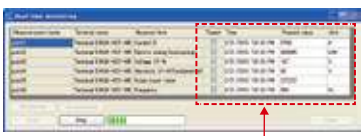
Converter
*2 *3

PC with Data Acquisition software installed*1

Main Screen



(1) Current Values Display



Selected measurement items are displayed in real time

Current values are updated every one second

(2) Measurement data is logged in the specified cycle.

Data Storage

Data is logged in CSV format every one minute or one hour.

(3) Logging data is output in Excel format.

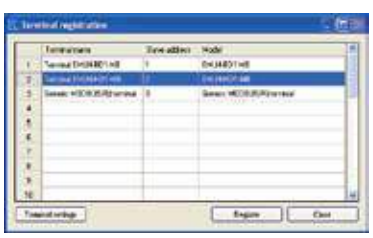
Monthly, daily and detailed (one minute) data is output in Excel format.

You can output any reports you want by saving data in a report format to the specified folder.

(4) Communications are used for settings

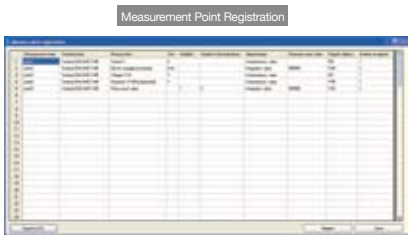
Communication Settings

Terminal Registration



Terminal Settings

Measurement Point Registration



Note: (1) Display of current values and (2) Measurement data logging cannot be performed at the same time.

5 Examples of GOT1000 Series Applications

■On-site Visualization of Energy Data

For customers who want on-site visualization of energy consumption, and to manage the correlation of Production and energy!

[GOT1000 Series + MODBUS® RTU (RS485) Communication Application]

You can directly connect to the Mitsubishi GOT* by using MODBUS® RTU communication.
Displaying various energy information on a GOT installed on-site allows you to improve on-site energy-conservation awareness and perform production management to fit the energy conditions.

MODBUS® RTU
(RS485) Communication

GOT1000 Series

You can use MODBUS® RTU communication to directly connect to a Mitsubishi GOT*.

*Compatible with GOT1000 series units that are standard-equipped with an RS485 serial port

Sample Screen

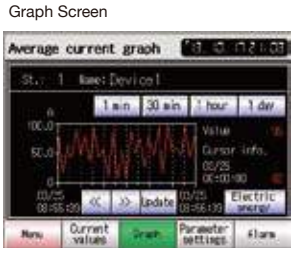
A sample Mitsubishi GOT*1 screens are provided.
You can view current values of various energy information such as power, current and voltage, and also display graphs of current and electric energy*2.
You can download the sample GOT screen free of charge from the Mitsubishi Electric FA website.

*1: GT14**-Q, GT1030 *2: Only compatible with GT14**-Q.

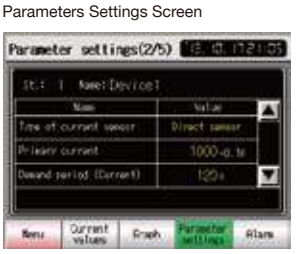
■GT14

Main Screen

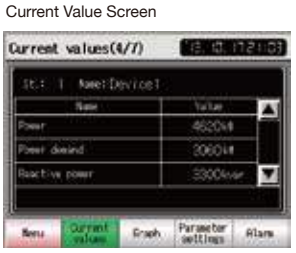
Graph Screen



Parameters Settings Screen



Current Value Screen

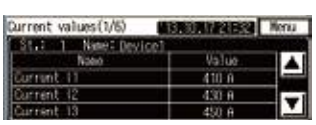


Alarm Screen

■GT10

Main Screen

Current Values Monitor Screen



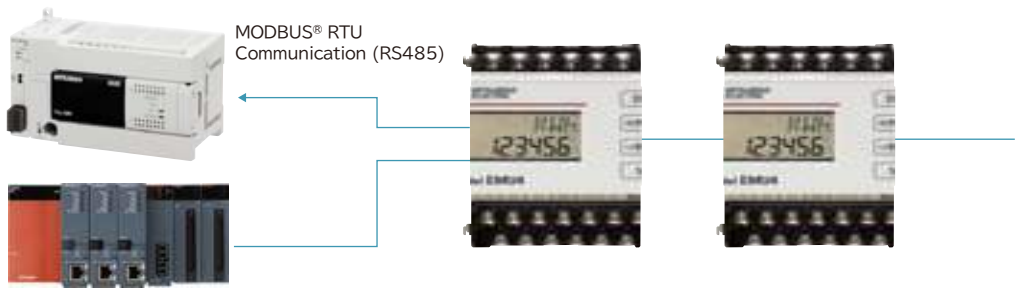
6 Connection to PLC System

■Energy Management with PLC

For custormers who want to capture energy information in the PLC system, and manage production information and other types of data in an integrated manner.

Available uses include preventive equipment maintenance by using energy amount measurement and real-time measurement of each piece of production equipment, and linking of quality control indicators with production information.

MODBUS® RTU (RS485) Communication Connection*



*In order to connect with a PLC, a module that is compatible with MODBUS® RTU (RS485) communication is required.

CC-Link Communication Connection*

*In order to connect with a PLC, a unit that is compatible with CC-Link communication is required.

7 Connection to EcoWebServerⅢ System

■EcoWebServerⅢ

EcoWebServerⅢ (Energy-Saving Data Collecting Server) and CC-Link Communication Unit Application

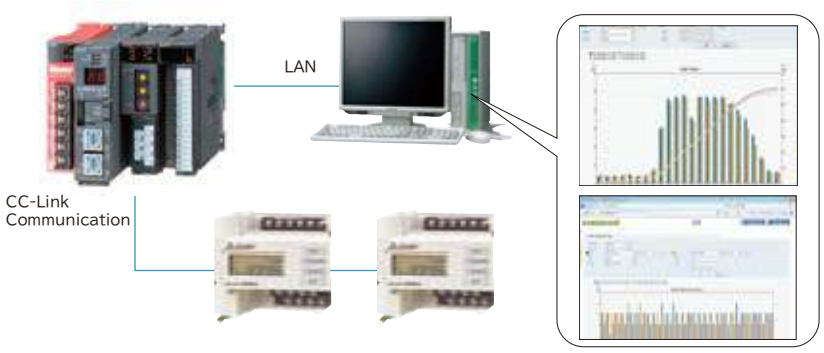
Adding a communication unit to an already installed energy measuring unit allows you to use the EcoWebServerⅢ system to visualize energy and perform simple analysis of measurement data.

What is EcoWebServerⅢ?

EcoWebServerⅢ is a device that collects the data of various measurement terminals using CC-Link communication network, and displays graphs of measurement data (such as power, current and voltage) and current value data in a Web browser.

Features of EcoWebServerⅢ

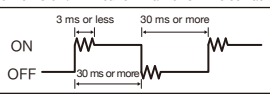
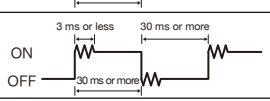
(1) Reduces unnecessary labor and cost by collecting energy information from various measurement terminals, and storing and visualizing data without the need for programming.
(2) Measurement data can be viewed in graphs of zoom (1 minute and 5 minutes), daily, monthly and annual formats.
(3) Production information can be captured to display specific consumption rate graphs.



EcoWebServerⅢ
(Energy-Saving Data Collecting Server) Catalog

Energy Measuring Unit

▶General Specifications

Item			Specification	
Model			EMU4-HD1-MB	EMU4-BD1-MB
Phase wire system			Single-phase 2-wire, single-phase 3-wire, three-phase 3-wire and three-phase 4-wire (Settings switching)	Single-phase 2-wire, single-phase 3-wire and three-phase 3-wire (Settings switching)
Instrument ratings	Voltage circuit	Single-phase 2-wire Single-phase 3-wire	110V, 220V, 440V AC Common (*2)	110V, 220V AC Common (*1)
		3-phase 3-wire	110V AC(between wires 1 and 2, and 2 and 3), 220V AC (between wires 1 and 3)	
		3-phase 4-wire	Min.: 63.5V/110V AC , Max.: 277 V/480V AC (*3)	—
	Current circuit		50A, 100A, 250A, 400A, 600A AC (Dedicated split current sensor is used. All values indicate primary current values of current sensor.) 5A AC (Dedicated 5A current sensor is used. A transformer (CT) is used in two-step configuration together with the 5A current sensor in order to allow a maximum primary current value setting of 6,000 A.) (*4)	
	Frequency		50 Hz to 60 Hz (Automatic frequency selection)	
Auxiliary power rating			100V—240V AC（+10%、—15%）50Hz／60Hz	
No. of measurement circuits			1	
Consumption VA		Voltage circuit	For each phase: 0.1 VA (110V AC), 0.2 VA (220V AC), 0.4 VA (440V AC)	
		Auxiliary power circuit	110V AC : 9VA 220V AC : 10VA	
Measured items			Current, demanded current, voltage, power, demanded power, reactive power, power factor, frequency, electric energy (consumption, regenerative), reactive electric energy and operating time	
			Apparent power, harmonic current, harmonic voltage, pulse count value, periodic electric energy and CO_2 conversion value	—
Main unit tolerances (*5)			Current, voltage, power, reactive power, apparent power, frequency: ± 1.0% (relative to rated input) Power factor: ± 3.0% Electric energy: ± 2.0% (in 5 to 100% range of rated values; Power factor = 1) Reactive electric energy: ± 2.5% (in 10 to 100% range of rated values; Power factor = 0) Harmonic current, harmonic voltage: ± 2.5%	
Data update cycle			250 ms *Electric energy and reactive electric energy are always sampled (following short-cycle load fluctuation also).	
Demand time limit setting			0 sec, 10 sec, 20 sec, 30 sec, 40 sec, 50 sec, 1-15 min. (per 1 min.), 20 min, 25 min and 30 min.	
External input specifications	Input signal format		Non-voltage a contact, 1 input (Select from the below functions)	—
	Functions		Set to pulse input: Pulse count (0 to 999,999 count)	—
			Set to contact input: Contact monitoring only During contact monitoring + Electric energy measurement during operation (contact on)	—
	Insulation type		Photocoupler insulation	—
	Rated input voltage/current		Use a voltage/current that is appropriate for this switching due to the DC 5 V/7 mA current that flows in the contacts.	—
	Input conditions	Pulse	Pulse-on time: 30 ms or more Pulse-off time: 30 ms or more Chattering time: 3 ms or less 	—
		Contacts	Contact on time: 30 ms or more Contact off time: 30 ms or less Chattering time: 3 ms or less 	—
External output specifications	Output signal type		Non-voltage a contact, 1 output (Select from the below functions)	—
	Functions		Monitoring of current demand upper limit Monitoring of current demand lower limit Monitoring of voltage upper limit Monitoring of voltage lower limit Monitoring of power demand upper limit Monitoring of power demand lower limit Monitoring of power factor upper limit Monitoring of power factor lower limit Monitoring of pulse count upper limit Automatic reset/Self-retention can be selected	—
	Insulation type		Semiconductor relay insulation	—
	Rated switching voltage/current		DC35V、75mA AC24V、75mA（Power factor = 1）	—
Pulse Output Specifications	Output item		Electric energy	—
	Output signal type		Non-voltage a contact, 1 output ・Pulse units (kWh/pulse): 0.001, 0.01, 0.1, 1, 10, 100 Refer to the operation manual of a main unit for the details of a pulse setup.	—
	Insulation type		Semiconductor relay insulation	—
	Rated switching voltage/current		DC35V、75mA AC24V、75mA（Power factor = 1）	—
	Output pulse width		0.1～0.15s	—
Power interruption backup	Recorded items		Set values, electric energy (consumption, regenerative), reactive electric energy, periodic electric energy, pulse count value and operating time(Stored in the nonvolatile memory)	

Item		Specification	
Model		EMU4-HD1-MB	EMU4-BD1-MB
Compatible standards		EMC:EN-61326-1:2006 Safety:EN-61010-1:2010	
Operating environment	Operating temperature range	−5°C～+55°C (average daily temperature of 35°C or less)	
	Operating humidity range	30%～85% (no condensation)	
	Storage temperature range	−10°C～+60°C	
	Altitude	2,000 m or less	
Commercial-frequency withstand voltage		Applies to all terminals (excluding communication and frame GND terminals) , between external boards: 2,000V AC for 1 min.	
		Applies to all current/voltage inputs, between auxiliary powers: 2,000V AC for 1 min.	
		Applies to all current/voltage inputs and auxiliary power terminals, between all digital/pulse input, pulse/alarm output and communication terminals: 2,000V AC for 1min.	
Insulation resistance		In the same locations described above: 10 MΩ or more (500V DC)	
Compatible wiring	Auxiliary power/Voltage input terminal	AWG24-14 (Single/Stranded wire) (Single wire: ϕ0.41 to ϕ1.62 mm, Stranded wire: 0.13 to 2.0 mm²)	AWG24-16 (Single/Stranded wire) (Single wire: ϕ0.52 to ϕ1.29 mm, Stranded wire: 0.21 to 1.3 mm²)
	Current input and input/output terminal	AWG22-14 (Single/Stranded wire) (Single wire: ϕ0.65 to ϕ1.62 mm; Stranded wire: 0.35 to 2.0²)	
Tightening torque	Auxiliary power/Voltage input terminal screw	0.8～1.0N・m	0.8N・m
	Current input and input/output terminal screw	0.5～0.6N・m	
	Board installation screw	0.63N・m	
Weight		0.3kg	0.2kg
External dimensions (units: mm)		75 (W) ×90 (H) ×75 (D) (Excluding protruding parts)	

*1: 110 V and 220 V can be connected directly. An externally mounted voltage transformer (VT) is needed for voltages greater than those (primary voltage of up to a maximum of 6,600 V).
*2: 110 V, 220 V and 440 V can be connected directly. An externally mounted voltage transformer (VT) is needed for voltages greater than those (primary voltage of up to a maximum of 6,600 V).
*3: 63.5 V / 110 V - 277 V / 480 V can be connected directly. An externally mounted voltage transformer (VT) is needed for voltages greater than those (primary voltage of up to a maximum of 6,600 V).
*4: The settable primary current when using a 5A current sensor is as follows:
5A、6A、7.5A、8A、10A、12A、15A、20A、25A、30A、40A、50A、60A、75A、80A、100A、120A、150A、200A、250A、300A、400A、500A、600A、750A、800A、1000A、1200A、1500A、1600A、2000A、2500A、3000A、4000A、5000A、6000A
(The CT primary side can be freely specified up to 6,000 A. However, the CT secondary side is fixed at 5 A.)
*5: Refer to “Specifications: Options (Split Current and 5A Current Sensors)” on p. 19 for the current sensor error ratios.

▶ Specifications of MODBUS®RTU Communication

Item	Specification
Physical interface	RS485 2wires half duplex
Communication protocol	MODBUS® RTU mode
Transmission method	Asynchronous
Transmission wiring type	Multi-drop bus (either directly on the trunk cable, forming a daisy-chain)
Baud rate	2400、4800、9600、19200、38400bps (default: 19,200 bps)
Data bit	8
Stop bit	1,2 (default: 1)
Parity bit	ODD、EVEN、NONE (default:EVEN)
Slave address	1～255 (FFh) (default: 1) 0: Broadcast
Response time	1s or shorter from completion of receiving query data to response transmission
Terminating resistor	120Ω 1/2W
Transmission distance	1,200m
Maximum connectable devices	31 devices
Recommended cable	SPEV (SB) -MPC-0.2×3P (Mitsubishi cable industries)

Logging Unit

▶General Specifications

Item		Specification
Model		EMU4-LM
Auxiliary power rating		6.4V DC (Power supplied from energy measuring unit)
Power interruption backup		Total power interruption backup time of the lithium battery (EMU4-BT) is one year (avg. daily temp. of 35°C or less); Mitsubishi Electric recommends replacing the battery every three years.
	Set values	Saved in FRAM (non-volatile memory) *Data is not deleted if there is a power outage.
	Logging data System log data	Saved in SRAM (volatile memory) *Data is deleted if there is a power outage when the battery voltage is low (BAT.LED lights up).
	Timer operation	*Timer operation is initialized if there is a power outage when the battery voltage is low (BAT.LED lights up). After the power is recovered, timer operation starts from the time of 2013/01/01 00:00:00.
Clock accuracy		1 min./Month difference
Output data storage media (*1)		SD memory card (SD, SDHC)
Compatible model		Energy measuring unit (EcoMonitorLight) EMU4-BD1-MB、EMU4-HD1-MB
Compatible standard		EMC:EN-61326-1:2006
Operating environment	Operating temperature range	−5°C～+55°C (daily average temperature of 35°C or less)
	Operating humidity range	30%～85%RH (no condensation)
	Storage temperature range	−10°C～+60°C
	Altitude	2,000 m or less
Weight		0.1 kg *Weight of the logging unit only.
Dimensions (units: mm)		25 (W) x 99 (H) x 60 (D) * Dimensions of the logging module only.
Expected product life		10 years (Under operating environment conditions)
Parts sold separately		SD memory card (EMU4-SD2GB) (*1)
Consumables sold separately		Lithium battery for logging unit (EMU4-BT) (*2)

*1: Please contact local sales representative.
*2: The lithium battery for logging units is attached at the one time of logging unit purchase.

▶Logging Specifications

Item		Specification
Logging mode	Automatic refresh	Automatic overwrite/refresh
	Date/Time designation	Automatic start based on start time setting
Logging data type	Detailed data	Measurement data is memorized according to the specified “Detailed Data Logging Cycle” (1 sec., and 1, 5, 10, 15 and 30-minute cycles)* Output as a detailed data file.
	1-hour data	Measurement data is memorized in 1-hour cycles. * Output as 1-hour and 1-day data files.
Amount of logging element	Detailed data	Detailed data logging cycle: 1 sec. → Max. of 4 elements Detailed data logging cycle: Other than 1 sec. → Max. of 10 elements
	1-hour data	Max. of 10 elements
Internal memory logging period	Detailed data	Detailed data logging cycle: 1 sec. → 20 hours Detailed data logging cycle: 1 min. → 20 days Detailed data logging cycle: 5 min. → 100 days Detailed data logging cycle: 10 min. → 200 days Detailed data logging cycle: 15 min. → 300 days Detailed data logging cycle: 30 min. → 600 days
	1-hour data	620 days (approx. 20 months)
SD memory card (2 GB) Logging period (*4)		Detailed data logging cycle: 1 sec. →10 months Detailed data logging cycle: 1, 5, 10, 15 and 30-min. → 10 years or more
System log data		3,600 records
Output format of logging and system log data		CSV format (ASCII code)

*4: The period indicated is that until the capacity of a 2 GB SD memory card is exceeded when it is constantly connected. The data amount varies depending on the amount of characters. The logging period indicates output at maximum capacity.

CC-Link Communication Unit

▶Basic Specifications

Item		Specification
Model		EMU4-CM-C
Auxiliary power rating		6.4V DC (6.4V DC Power supplied from energy measurement unit)
Compatible model		Energy measuring unit（EcoMonitorLight） EMU4-HD1-MB、EMU4-BD1-MB
Compatible standard		EMC EN-61326-1:2006
Operating environment	Operating temperature range	−5°C～+55°C (daily average temperature of 35°C or less)
	Operating humidity range	30%～85%RH (no condensation)
	Storage temperature range	−10°C～+60°C
	Altitude	2,000m or less
Weight		0.1 kg *Weight of the CC-Link communication unit main unit only.
Dimensions (units: mm)		25(W)×99(H)×60(D)
Expected product life		10 years (Under operating environment conditions)

▶CC-Link Communication Specifications

Item	Specification
Number of Occupied Station	1 Station Remote device station (I/o)data and word data can be transmitted
CC-Link Ver 1.10 Ver. 2.00 (Set by Version change switch)	Ver. 1.10, Ver. 2.00 (Set by version change switch)
Remote Station Number (Station Number)	1 to 64
Baud Rate	156K, 625K, 2.5 M, 5M, and 10Mbps (Changes according to setting) (The interstation cable length and maximum total cable extension distance vary according to the transmission speed.) *100m(10M)～1,200m(156k)
Max.connected device	A maximum of 42 units can be connected if configured using only this module.
Cable terminating resistance	Use a specified cable for CC-Link communication connection. Resistance values for terminating resistance are different according to the type of specialized cable used.

Optional Parts

▶Split-type Current Sensor

Item	Specifications				
Model	EMU-CT50	EMU-CT100	EMU-CT250	EMU-CT400	EMU-CT600
Rated primary current	50A AC	100A AC	250A AC	400A AC	600A AC
Rated secondary current	16.66mA	33.33mA	66.66mA	66.66mA	66.66mA
Rated load	0.1VA				
Maximum use voltage	460V AC				
Ratio error	±1% (5 to 100% of rating, RL ≤ 10 Ω)				
Phase difference variation	±30 min. (5 to 100% of rating, RL ≤ 10 Ω)				
Measurement category	Ⅲ				
Degree of contamination	2				
Operating temperature range	-5 °C to +55 °C (daily average temperature of 35°C or less)				
Operating humidity range	5% to 95% RH (no condensation)				
CE marking compatible standard	EN61010-2-32				
Maximum voltage compatible with CE marking	460V AC				
Weight (1 unit)	0.1kg			0.7kg	

▶5A Current Sensor

Item	Specifications
Model	EMU2-CT5、EMU2-CT5-4W
Rated primary current	5A AC
Rated secondary current	1.66mA
Rated load	0.1VA
Maximum use voltage	260V AC
Ratio error	±1%（5 to 100% of rating）
Phase difference variation	±30 min. (5 to 100% of rating, RL ≤ 10 Ω)
Measurement category	Ⅲ
Degree of contamination	2
Operating temperature range	—5°C～+55°C (daily average temperature of 35°C or less)
Operating humidity range	5%～95%RH (no condensation)
CE marking compatible standard	EN61010-2-32
Maximum voltage compatible with CE marking	260V AC
Weight (1 unit)	0.1kg

▶SD Memory Card for Logging unit

Item	Specifications
Model	EMU4-SD2GB
Memory capacity	2GB
Weight	2g

▶Lithium battery for logging unit

Item	Specifications
Model	EMU4-BT
Type	Manganese dioxide lithium battery
Nominal voltage	3V
Capacity	220mAh
Weight	9g

* It is attached at the one time of logging unit purchase.

Software

▶Data Acquisition Software (EMU4-SW1)

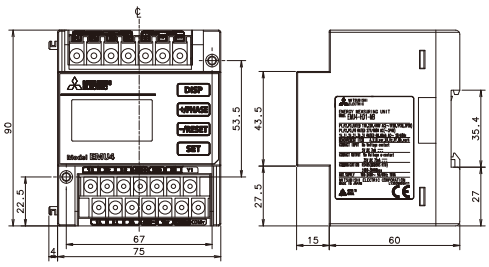
Item		Specifications
Recommended system environment	Operating System	•Microsoft Windows 7 Professional (32bit or 64bit) SP1 •Microsoft Windows Vista Ultimate 32bit SP2 •Microsoft Windows XP Professional 32bit SP3
	Microsoft. NET Framework	•Microsoft. NET Framework 2.0 (Required)
	Microsoft Excel	•Microsoft Excel 2003 SP3/2007 SP3/2010 SP1
Basic specifications	Max. amount of connections	31 units (Maximum connected units of MODBUS® RTU communication)
	Languages	Japanese, English
Data collection functions	Periodic collection	Data is collected and logged in 1-min. or 1-hour cycles. (Operated in background by the OS task scheduler.)
	Current value display	Constant communication is performed to display current values (Cannot be displayed during periodic collection.)
	Max. amount of collection points	124 items
Setting functions	Communication settings	MODBUS® RTU communication settings (such as baud rate, stop bit length and parity bit)
	Terminal registration	Register the terminal performing data collection
	Terminal settings	Terminal settings functions (such as phase wire, rated current and rated voltage)
	Measured items registration	Measured items of collected data are registered.
	Export/Import	Set values of communication, terminals and measured items are saved in or read out from a file.
Report output	Output format	Paste aggregate data in an Excel template file. (Excel template files can be freely edited.)
	Output types	Monthly, daily and detailed (1-min intervals)

* Data Acquisition Software (EMU4-SW1) carries out gratis download, and gets from the "design supportive tool data" of the Mitsubishi Electric web site (http://www.MitsubishiElectric.co.jp/haisei/lvs/) energy-saving supporting aircraft machine menu.

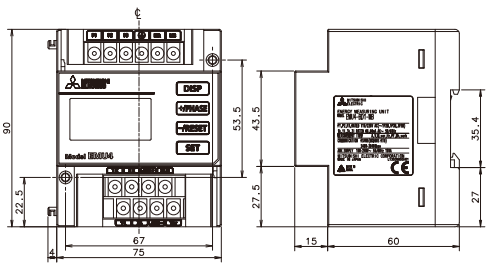
Energy Measuring Unit

Units (mm)

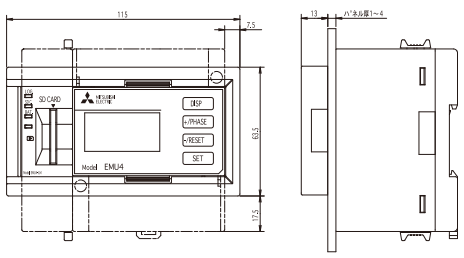
〔High Performance Model〕EMU4-HD1-MB



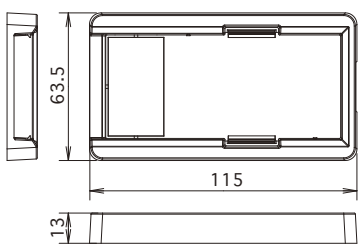
〔Standard Model〕EMU4-BD1-MB



Panel Mounting Attachment (EMU4-PAT) when Installed



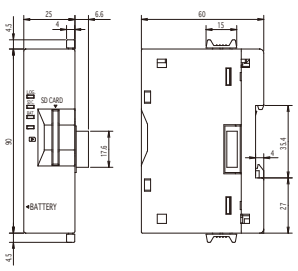
Panel Mounting Attachment (EMU4-PAT)



Logging/Communication Unit

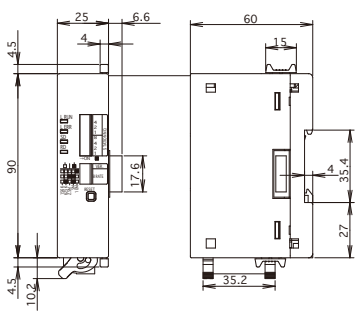
Logging Unit

(EMU4-LM)

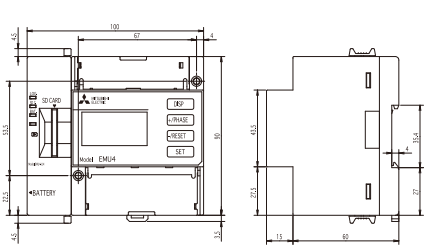


CC-Link Communication Unit

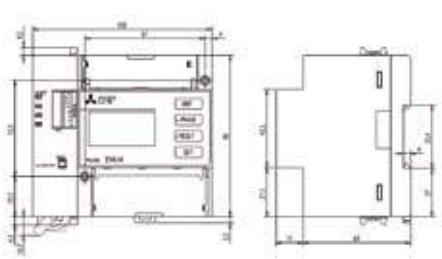
(EMU4-CM-C)



Energy Measuring Unit + Logging Unit



Energy Measuring Unit + CC-Link Communication Unit

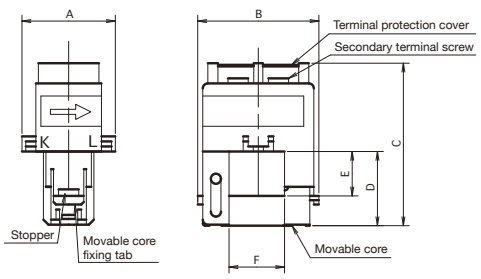


Optional Parts

Units (mm)

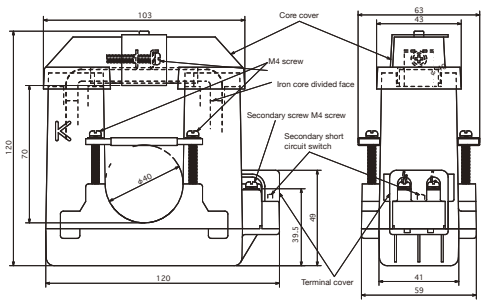
Split-type Current Sensor

Split-type Current Sensor EMU-CT50、EMU-CT100、EMU-CT250

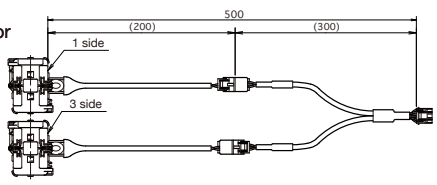


Model	A	B	C	D	E	F
EMU-CT50/CT100	31.5	39.6	55.2	25.7	15.2	18.8
EMU-CT250	36.5	44.8	66.0	32.5	22.0	24.0

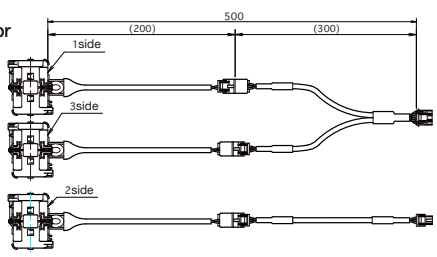
Split-type Current Sensor EMU-CT400、EMU-CT600



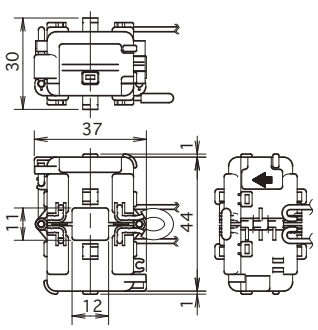
5A Split-type Current Sensor



5A Split-type Current Sensor

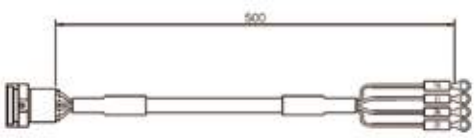


Detail of Sensor Part

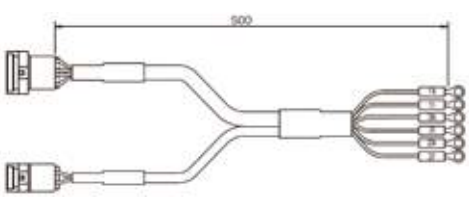


Current Sensor Cable

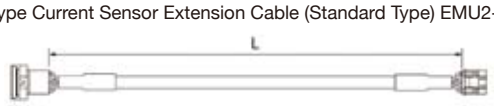
5A Split-type Current Sensor Cable EMU2-CB-Q5B



5A Split-type Current Sensor EMU2-CB-Q5B-4W

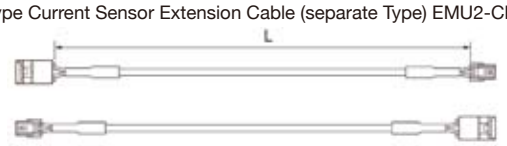


5A Split-type Current Sensor Extension Cable (Standard Type) EMU2-CB-T＊＊M



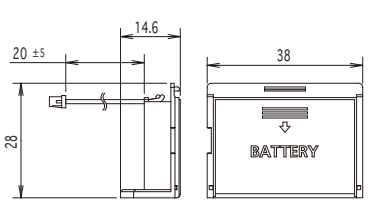
Model	EMU2-CB-T1M	EMU2-CB-T5M	EMU2-CB-T10M
L dimension	1m	5m	10m

5A Split-type Current Sensor Extension Cable (separate Type) EMU2-CB-T＊＊M

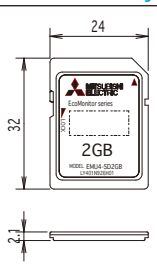


Model	EMU2-CB-T1MS	EMU2-CB-T5MS	EMU2-CB-T10MS
L dimension	1m	5m	10m

Logging Unit Lithium Battery

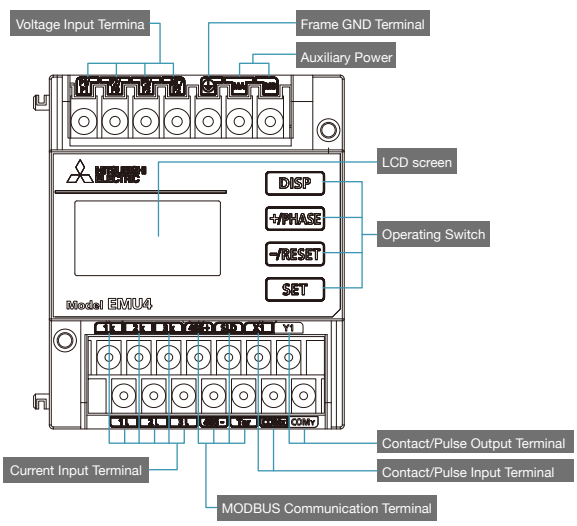


Logging Unit SD Memory Card



Energy Measuring Unit

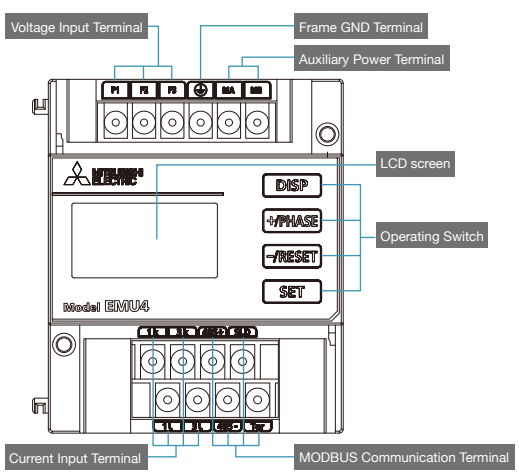
[High Performance Model] EMU4-HD1-MB



▶Codes and Functions of Terminal Block

Terminal Code	Function	Description
P1/P1,P2/P0 P3/P3,NC/F2	Input voltage	Connect the voltage input wire for the measuring circuit.
⏚	Frame GND (FG)	Connect to ground (D type ground).
MA,MB	Auxiliary power	Connect the auxiliary power supply.
1k,1L,2k,2L 3k,3L	Input current	Connect the secondary output of the dedicated current sensor connected to the current wire of the measurement circuit.
485+,485-	MODBUS® RTU communication	Connect the MODBUS® RTU communication wire.
SLD		Connect to ground (D type ground).
Ter		Connect with 485- terminal only if installed at the first terminal (→ Refer to p. 26 for the MODBUS®RTU communication system configuration).
X1,COMX	Pulse /Contact input	Connect pulse/contact input wires.
Y1,COMY	Pulse /Contact output	Connect pulse/contact output wires.

[Standard Model] EMU4-BD1-MB



▶Codes and Functions of Terminal Block

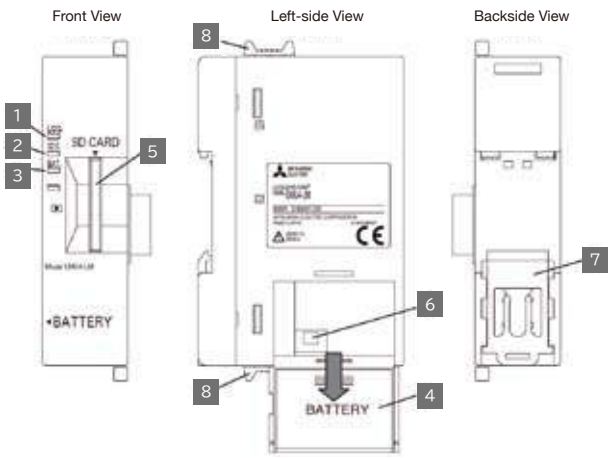
Terminal Code	Function	Description
P1,P2,P3	Input voltage	Connect the voltage input wire for the measuring circuit.
⏚	Frame GND (FG)	Connect to ground (D type ground).
MA,MB	Auxiliary power	Connect the auxiliary power supply.
1k,1L,3k,3L	Input current	Connect the secondary output of the dedicated current sensor connected to the current wire of the measurement circuit.
485+,485-	MODBUS® RTU communication	Connect the MODBUS® RTU communication wire.
SLD		Connect to ground (D type ground).
Ter		Connect with 485- terminal only if installed at the first terminal (→Refer to p. 26 for the MODBUS®RTU communication system configuration).

Display Screen

No.	Segment Name	Description
1	Measured value display	Digitally displays measured values.
2	Display of measured items	Displays the measured item for the value displayed
3	Communication display	Only lights up if a logging unit or communication unit is connected.
4	Energy measurement display	Lights up when measuring electric energy (consumption).
5	Settings display	The SET icon lights up when in setting mode. The SET icon lights up when in setting confirmation mode.

Logging/Communication Unit

Logging Unit EMU4-LM

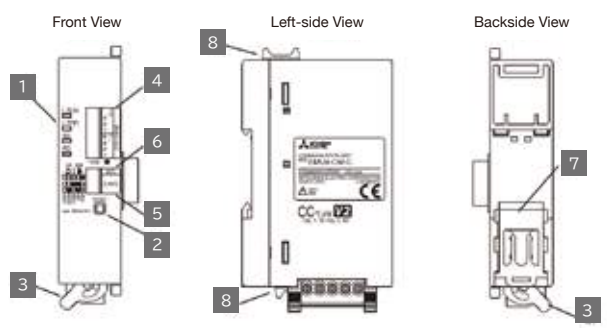


▶Names and Functions of Each Part

No.	Name	Function
1)	LOG.LED	Displays logging operation status. Lit up: Logging is being performed. Not lit up: Logging operation is stopped. Slow flashing*1 (5 sec.): Changing of logging conditions settings has been completed. Fast flashing*2 (30 sec.): Changing of logging conditions settings has failed. Fast flashing*2: Error has occurred.*3
2)	SDC.LED	Displays SD memory card communication status. Lit up: Communication is being performed. Not lit up: Communication is stopped. Fast flashing*2: SD memory card error*3
3)	BAT.LED	Displays the battery voltage status Lit up: Battery voltage is low*4. Not lit up: Battery voltage is normal
4)	Battery box	Contains the battery for performing backup of current time, logging and system log data.
5)	SD memory card slot	Slot for inserting the SD memory card
6)	Battery connector	Connector for connecting the battery.
7)	IEC rail stopper	Used for fixing to the IEC rail.
8)	Coupling tab	Used for fixing the logging unit. to the energy measuring unit.

*1: Slow flashing: Lit up for 0.5 sec. → Not lit up for 0.5 sec. → Lit up for 0.5 sec. (pattern is repeated)
*2: Fast flashing: Lit up for 0.25 sec. → Not lit up for 0.25 sec. →Lit up for 0.25 sec. (pattern is repeated)
*3: If this is lit up, refer to "Error Display and Recovery Procedures" of the "Operation Manual (Detailed Version)".
*4: Turning the power off when the battery voltage is low deletes the current time and logging data. (Set values for logging ID, logging mode, logging start time, detailed data logging cycle and logging items are not deleted due to being stored in non-volatile memory.) Replace the battery if BAT. LED lights up.

CC-Link Communication Unit EMU4-CM-C



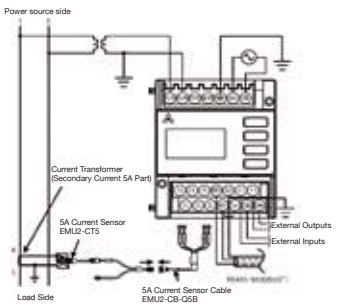
▶CC-Link Communication Unit EMU4-CM-C

No.	Name	Function
1)	L RUN/L ERR/SD/RD LED	Displays the CC-link communication status.
2)	Reset switch	Press after setting or changing the STATION, B RATE, VER.
3)	CC-Link communication connector	Connect the CC-link signal wire.
4)	STATION switch	Station setting switch: Set the CC-Link station number.
5)	B RATE switch	Baud rate setting switch. Set the CC-Link transmission speed.
6)	VER. switch	Switch for changing the CC-Link version.
7)	IEC rail stopper	Used for fixing the IEC rail.
8)	Coupling tab	Used for fixing the CC-Link communication unit to the energy measuring module.

Connection Configurations

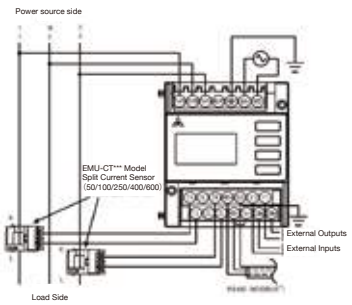
For EMU4-HD1-MB

1P2W (For high-voltage circuit)



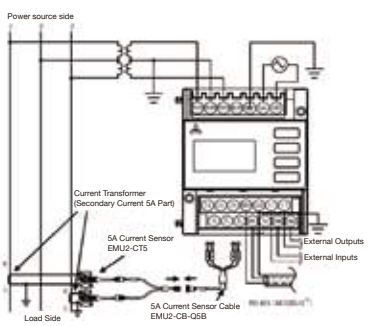
Name	Model	Amount
EcoMonitorLight [High Performance Model]	EMU4-HD1-MB	1
Split-type Current Sensor	EMU2-CT5	1
5A Current Sensor Cable	EMU2-CB-Q5B	1

1P3W/3P3W (For low-voltage circuit)



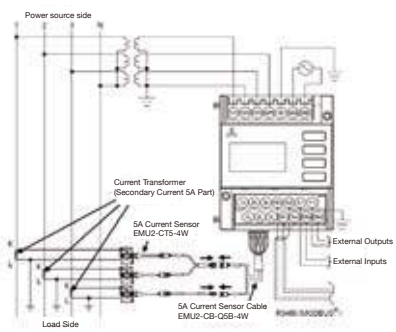
Name	Model	Amount
EcoMonitorLight [High Performance Model]	EMU4-HD1-MB	1
Split-type Current Sensor	EMU-CT*** (50/100/250/400/600)	2

3P3W (For high-voltage circuit)



Name	Model	Amount
EcoMonitorLight [High Performance Model]	EMU4-HD1-MB	1
Split-type Current Sensor	EMU2-CT5	1
5A Current Sensor Cable	EMU2-CB-Q5B	1

3P4W (For high-voltage circuit)

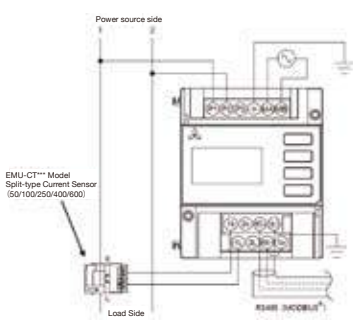


Name	Model	Amount
EcoMonitorLight [High Performance Model]	EMU4-HD1-MB	1
Split-type Current Sensor	EMU2-CT5-4W	1
5A Current Sensor Cable	EMU2-CB-Q5B-4W	1

Note:
- The cable (electrical wire) for between EMU-CT*** and the Split-type Current Sensor is provided by the customer. Check the wiring precautions on p. 26 for the cable (electrical wire) used.
- If installing to a low-voltage (600 V or less) circuit, it is not necessary to connect the secondary electrical circuit of the voltage transformer to ground.

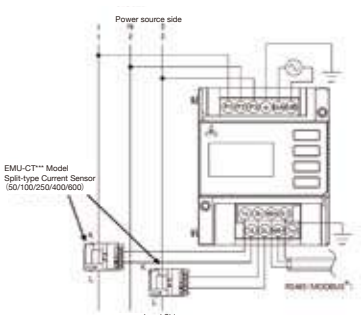
For EMU4-BD1-MB

1P2W (For low-voltage circuit)



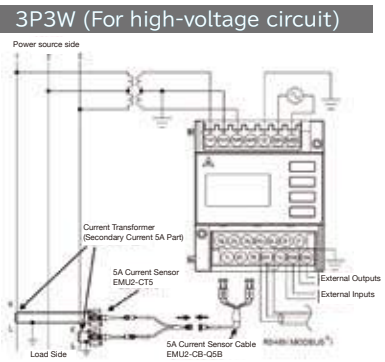
Name	Model	Amount
EcoMonitorLight [Standard Model]	EMU4-BD1-MB	1
Split-type Current Sensor	EMU-CT*** (50/100/250/400/600)	1

1P3W/3P3W (For low-voltage circuit)



Name	Model	Amount
EcoMonitorLight [Standard Model]	EMU4-BD1-MB	1
Split-type Current Sensor	EMU-CT*** (50/100/250/400/600)	2

3P3W (For high-voltage circuit)



Name	Model	Amount
EcoMonitorLight [Standard Model]	EMU4-BD1-MB	1
Split-type Current Sensor	EMU2-CT5	1
5A Current Sensor Cable	EMU2-CB-Q5B	1

Wiring Precautions

Measuring Unit

⚠ CAUTION

- Do not place transmission or input/output signal wires close to or bound together with power or high-voltage lines in order to prevent noise interference. If installing transmission or input/output signal wires next to power and high-voltage lines, maintain the separation distances shown on the right table. (Except for terminal blocks.)

Condition	Distance
Power lines of 600 V or less	300 mm or more
Other power lines	600 mm or more

- For actual usage, connect the frame GND terminal to ground (D-type ground). Connect it directly to the ground terminal.
- Do not connect to frame GND terminal during insulation resistance or voltage resistance testing.

●Use compatible solderless terminals. Refer to the compatible solderless terminals described in below table.
●Use electrical wires as described in below table, and tighten the terminal screws according to the torques described below.

[EMU4-HD1-MB]

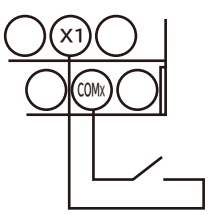
	Compatible wire	Tightening torque	Compatible solderless terminal
Auxiliary power and voltage input terminal	AWG26-14 (Single/Stranded)	0.8～1.0N･m	For M3.5 screws with an external diameter of 5.6 mm or less
Current input and input/output terminal	AWG22-14 (Single/Stranded)	0.5～0.6N･m	For M3.5 screws with an external diameter of 5.6 mm or less

[EMU4-BD1-MB]

	Compatible wire	Tightening torque	Compatible solderless terminal
Auxiliary power and voltage input terminal	AWG24-16 (Single/Stranded)	0.8N･m	For M3 screws with an external diameter of 5.6 mm or less
Current input and input/output terminal	AWG22-16 (Single/Stranded)	0.5～0.6N･m	For M3 screws with an external diameter of 5.6 mm or less

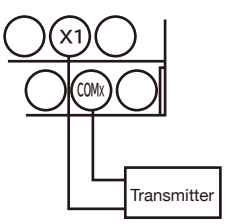
●Before connecting the cable, make sure that the split-type current sensor is appropriately installed with the correct orientation. K => L is the correct orientation.
K: Power source side; L: load side
●EMU-CT50, 100, 250, 400, and 600 are used only for low-voltage circuits (Maximum voltage: 460 V). They cannot be used for a high voltage circuit. Use EMU2-CT5 and EMU2-CT5-4W transfixed the secondary side (5A) of the current transformer. They can only be used directly in a circuit that is 200 V or less (max. voltage of 260 V).
●The maximum voltage of a circuit directly connected to this unit is 260 V for EMU4-BD1-MB, or 277/480 V for EMU4-HD1-MB. Always be sure to use a transformer for circuits exceeding this voltage. The value for the primary voltage of the transformer can be specified up to 6,600 V when using a transformer for circuits.
●Mitsubishi Electric recommends having an extra length of approximately 20 cm for MODBUS® communication wiring.
●Be careful not to touch the projecting parts of the terminal block cover when screwing the terminals at both ends of a terminal block.
●Refer to the following if using external inputs or outputs.

External Input
For contact input



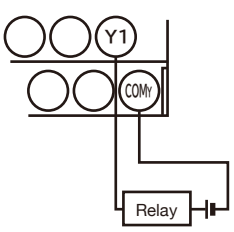
Non-voltage Contact
Use a type appropriate for
5V 7 mA DC switching.

External Input
For pulse input



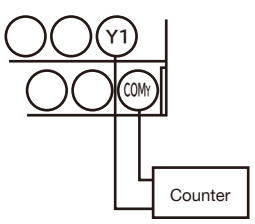
Non-voltage Contact
Use a type appropriate for
5V 7 mA DC switching.

External Output
For contact output



35V 75 mA DC
or 24V 75 mA AC
(Power factor 1)

External Output
For pulse output

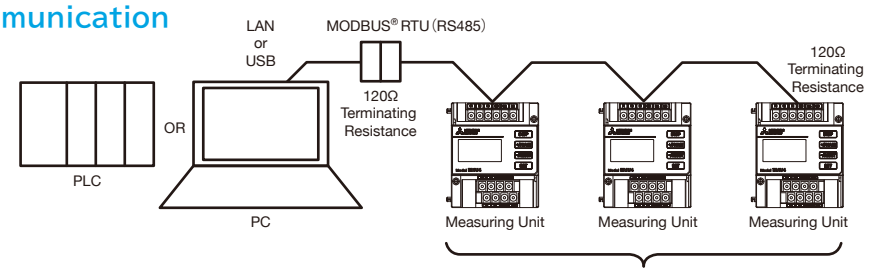


35V 75 mA DC
or 24 V 75 mA AC
(Power factor 1)

MODBUS®RTU (RS485) Communication

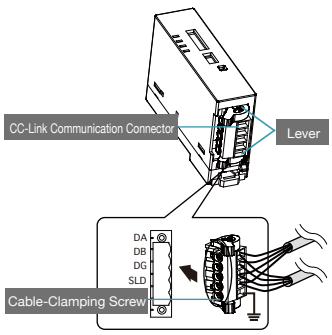
Connection of MODBUS® communication terminals (485+, 485-, SLD, and Ter):

1. Use shielded twisted pair cables for transmission wires. (Refer to p. 16 for recommended cables.)
2. Connect terminating resistance (120 Ω) to both ends of devices connected to MODBUS® transmission lines. Terminating resistance of 120 Ω can be achieved by short-circuiting terminals "485-" and "Ter" of this unit.
3. Connect to ground by using thick electrical wires so that low impedance is achieved.
4. Do not place MODBUS® communication signal wires close to or bound together with high-voltage lines.
5. Ground the SLD terminal at one end.



CC-Link Communication Unit

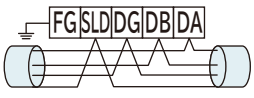
Wiring Procedures



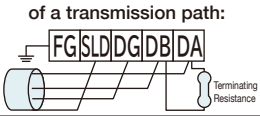
①Rotate the levers on both ends of the CC-Link communication connector and remove it from this unit.
②Loosen the cable-clamping screw of the CC-Link communication connector.
Use a thin flat-head screwdriver (tip thickness: 0.6mm; total length: 3.5 mm)
③Insert the signal wire according to the indications on the side of the CC-Link communication connector.
④Fix the wire using the cable-clamping screw. (Recommended torque: 0.5 to 0.6 N/m)
⑤Insert the CC-Link communication connector into its original position and secure using the levers on both ends.

Wire type	For one wire connection	For two wire connection
Single wire	ϕ0.2mm～ϕ2.5mm	Two wires×ϕ0.2mm to ϕ1.0mm
Stranded wire	0.2mm²～2.5mm²	Two wires×0.2mm² to 1.5mm²
Stranded wire, stranded wire with rod terminal (without insulation sleeve)	0.25mm²～2.5mm²	Two wires×0.25mm² to 1.0mm²
Stranded wire, stranded wire with rod terminal (with insulation sleeve)	0.25mm²～2.5mm²	—

When installed in the middle of a transmission path:



When installed at the end of a transmission path:



Notes
- Strip the insulation of signal wires to 7 mm. Do not plate the cable core with solder.
- Use dedicated cable for the CC-Link connection cable. Do not mix dedicated cables for CC-Link with dedicated high-performance cables for CC-Link. Normal data transmission cannot be guaranteed if cables are mixed. Terminating resistance values vary depending on the type of specialized cable used.
- Connect the shielded cable of the CC-Link connection cable to “SLD” and connect “FG” to D-type ground (insulation resistance of 100 Ω or less). “SLD” and “FG” are connected inside the unit.
- Always be sure to use dedicated wire for CC-Link communication wires, and satisfy the requirements for overall wiring and inter-station wiring distances, and terminating resistance values in accordance with the baud rate (B RATE). Failure to use dedicated wire or to satisfy the wiring conditions can result in communication error. (Refer to the operation manual included with the CC-Link master unit for dedicated wires and wiring conditions.)
- Units on both ends of a CC-Link communication line must always be installed with the terminating resistance of that attached to the CC-Link master unit. Connect between the DA and DB terminals if there is an energy measuring unit at the end of the CC-Link communication line.
- Terminating resistance values vary depending on the type of dedicated cable used for CC-Link. Refer to the terminating resistance manual packaged with the CC-Link master unit.

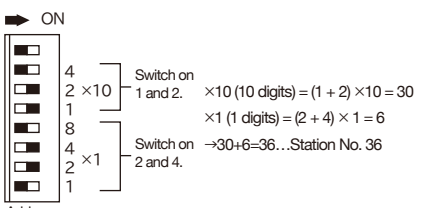
Setting Procedures

When connecting this unit to a CC-Link communication line, specify a different station number (STATION) for each unit, and also specify the transmission speed (B RATE) and CC-Link version (VER.) before energization. Always be sure to specify a station number and transmission speed because devices having a CC-Link communication function perform mutual communication using station numbers at the specified transmission speed.

⚠ CAUTION	・Do not use a mechanical pencil to switch the address setting or transmission speed switches. Broken lead or dust could get into the internal circuits, resulting in misoperation or malfunction. ・Press the RESET switch with appropriate force (1.6 N). Do not apply excessive force as doing so can result in a malfunction.

9.1 Setting the Station (STATION)

◎This unit is a remote device station occupying one station. The station number can be specified in a range from “1” to “64”.
◎The station number is the total of the values of station-number setting switches that are on.
◎Use a thin screwdriver or rod for switching on station-number setting switches.
◎For example, perform the following to specify number 36 as the station-number for this unit.
Turn on station-number setting switches 1 and 2 on the x10 side and 2 and 4 on the x1 side. (In the figure, the direction of the arrow indicates ON.)



9.2 Setting the Transmission Speed (B RATE)

◎Use a thin screwdriver or rod for switching the B RATE setting switches.
◎The relationship between transmission speed and setting switches is as shown on the right.
*Do not set in any other manner than that shown on the right because any other combination will result in an error.

Transmission Speed	158k	625k	2.5M	5M	10M
Setting					

* It is 158kbps in the case of OFF altogether.

9.3 Setting the CC-Link Version (VER.)

◎Use a flat thin screwdriver for switching the VER. setting switches.
◎The relationship between CC-Link version and setting switches is as shown on the right.

*The setting is fixed as one occupied octuplex station when set to Ver. 2.00.

CC-Link Version	Ver.1.10	Ver.2.00
Setting		

Press the RESET switch if you set or change the station number, transmission speed or CC-Link version after operating the equipment.
◎The RESET switch must be pressed to enable the specified settings.
◎It takes a few seconds for reset to be performed. Press and hold the RESET switch while checking for the L RUN LED to turn off before releasing the switch.

Notes
- The lengths of inter-station cables and maximum total cable length vary depending on transmission speed.
- Do specify stations so that there are two identical station numbers within the same transmission path. The existence of two identical station numbers will result in an error.
- Number of units which can be connected to CC-Link is determined by conditions 1 and 2 described on the right, and both conditions need to be satisfied.
A maximum of 42 units can be connected with this module. (Only when connected as a remote device station occupying one station.)

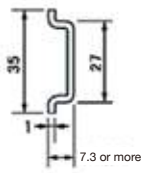
Condition 1: $\{(1\times A)+(2\times B)+(3\times C)+(4\times D)\}\leqq 64$
a: Amount of one-station occupying units.
b: Amount of two-station occupying units.
c: Amount of three-station occupying units.
d: Amount of four-station occupying units.

Condition2: $\{(16\times A)+(54\times B)+(88\times C)\}\leqq 2304$
A: Amount of remote I/O stations. B: Amount of remote device stations.
C: Amount of local stations.

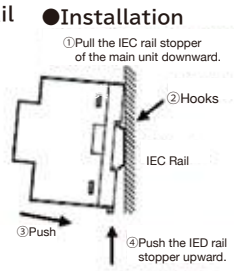
Energy Measuring Unit

IEC Rail Installation (Surface Installation)

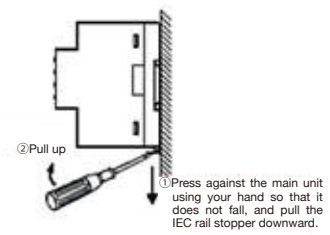
●Applicable IEC Rail (35mm)



●Installation

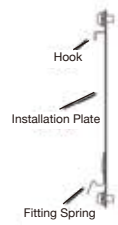


●Removal

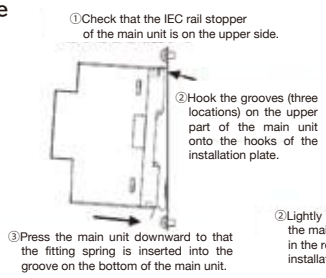


JIS-Compliant Dimensions Installation (Front-Surface Installation)

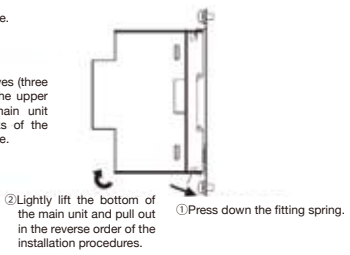
●JIS-Compliant Shape Installation Plate



●Installation



●Removal

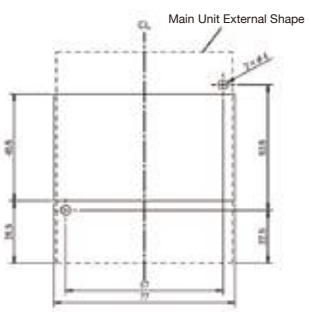


*If the display part protrudes from the plate surface at IEC rail and JIS-compliant form installation, cut the plate at a point 50 mm or more from door opening/closing support.

Board Installation

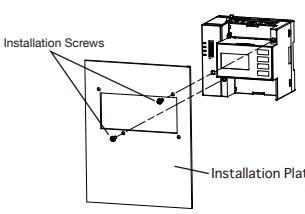
●Panel Cutting Dimensions

The panel cutting dimensions are as shown below.
Panel thickness allowable for installation is 1.6 to 4.0 mm.



●Installation Procedures

Install the screws (M3 X 10) to the installation plate.
Tightening torque: 0.63 N/m

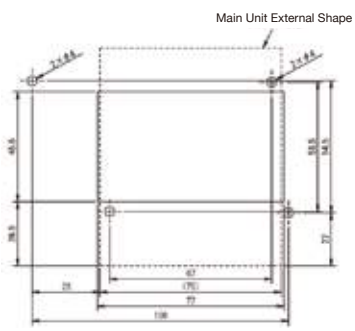


Recommended Installation Screws	Cross-recessed head machine screw with spring and plain washers JIS B 1188 M3 x 10, Two screws

Board Installation (Using Board Surface Installation Attachment (EMU4-PAT))

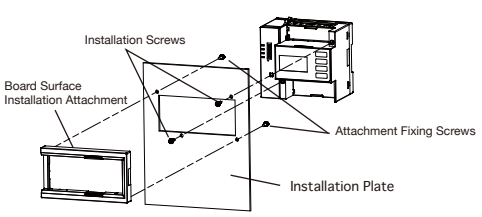
●Panel Cutting Dimensions

The panel cutting dimensions are as shown below.
Panel thickness allowable for installation is 1.6 to 4.0 mm.



●Installation Procedures

Install to the installation plate using the installation screws (M3 x 10) and install the board surface installation attachment.
Tightening torque: 0.63 N/m



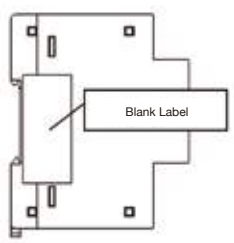
*Tighten the attachment with the screws in an environment with a large amount of vibration.
*The installation screws and attachment fixing screws are packaged with the attachment (sold separately).

Optional Units

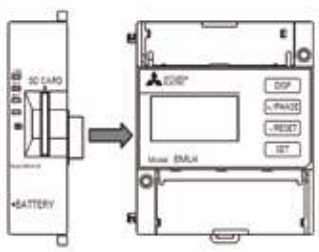
Common for Logging Unit and CC-Link Communication Unit

Connect optional units to the energy measuring unit.

①Peel off the blank label affixed to the left side of the main unit of the energy measuring unit.



②Insert the connector of the optional unit into the connector of the energy measuring unit to closely attach the unit.



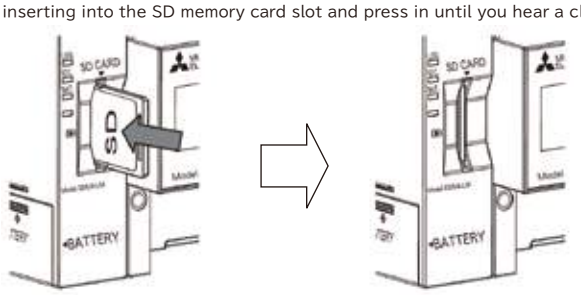
③Slide the coupling tab (green) on top of the optional unit to lock the optional unit.

⚠ CAUTION	Do not energize when connecting the energy measuring unit and do not perform live-wire installation. Doing so can result in electrical shock, device malfunction, fire and similar problems.

SD Memory Card for Logging Unit

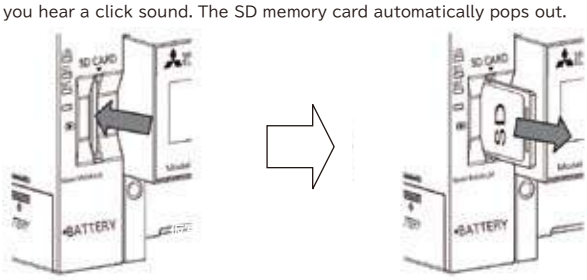
Insert the SD memory card into the logging unit.

Hold the SD memory card straight when inserting into the SD memory card slot and press in until you hear a click sound.



Remove the SD memory card from the logging unit.

Press the SD memory card inward until you hear a click sound. The SD memory card automatically pops out.



⚠ Caution	Do not remove the SD memory card until you have checked that the SD C. LED light has gone out. Removing the SD memory card while this unit is communicating with the SD memory card can damage the data in the SD memory card, and result in a malfunction of this unit and the SD memory card.

EcoMonitor Series

EcoMonitorLight

Simple, easy measuring with low cost ！

【Features】

- Low-cost series lineup
- Standard-equipped with MODBUS® RTU communication (RS485)
- Integrated display/settings device
- Optional units enable logging using an SD memory card, and connection with CC-Link communication
- Compliant with various standards (CE, UL and Korean Radio Law)
- Input/output of pulse/contact available with high-functionality model

EcoMonitorPro

Measure multiple circuits according to various applications!

【Features】

- You can select a model corresponding to the amount of circuits from one to seven.
- Different voltage and an unusual appearance line are measured by one set.
- The lineup of models with pulse-output and momentary detection functions allow you to select units according to your application.
- Uses limited space for installation and can be installed inside a board.

Specifications of Measurement Terminals

Model Name			EcoMonitorLight	EcoMonitorPro
External appearance				
External dimensions (mm)			W75×H90×D75	W186×H90×D97(7-Circuit Model)
Installation method			IEC rail or board-surface installation	IEC rail installation
No. of measurement circuits			1 circuits	Models with single-phase 2-wire, single-phase 3-wire and three-phase 3-wire: 1, 3, 5, and 7 circuits Three-phase 4-wire model: 2 and 4 circuits
Auxiliary power rating			100V-240V AC	100V-220V AC
Auxiliary power rating			①Single-phase 2-wire, single-phase 3-wire and three-phase 3-wire ②Common use of single-phase 2-wire, single-phase 3-wire,three-phase 3-wire and three-phase 4-wire*	Common use of single-phase 2-wire, single-phase 3-wire and three-phase 3-wire Dedicated three-phase 4-wire*
Input	Voltage	Single-phase 2-wire	110,220V AC	110,220V AC
		Single-phase 3-wire	100,200V AC	100,200V AC
		Three-phase 3-wire	①110,220V AC ②110,220,440V AC*	110,220V AC
		Three-phase 4-wire	63.5/110V ～ 277/480V AC	63.5/110V,110/190V,120/208V, 220/380V,240/415V AC
	Current	Dedicated current sensor	50A,100A,250A,400A,600A	50A,100A,250A, 400A,600A
		Combined with 5A sensor	Compatible up to max. of 6,000 A	Compatible up to max. of 3,000 A
Measurement items	Electric energy		○ Consumed and regenerated	○ Consumed
	Reactive energy		○	○*
	Current /demanded current		○ Current of each phase (1, 2, and 3) and overall	○ Current of each phase (1, 2, and 3) and overall
	Voltage		○ Voltage between each wire (1-2, 2-3, 3-1) and overall	○ Voltage between each wire (1-2, 2-3, 3-1) and overall*
	Power/demanded power		○	○*
	Reactive power		○	○*
	Apparent power		○*	—
	Power rate		○	○*
	Frequency		○	○*
	Harmonic current		○*	○*
	Harmonic voltage		○*	○*
	Periodic energy		○	—
	Pulse count value		○*	—
	Operating time		○	—
	CO_2 conversion value		○*	—
	Other		—	Simple demand (30 min.)
Communication			MODBUS®RTU（RS485） CC-Link communication (*A communication unit is required for CC-Link communication.)	CC-Link communication
Input			Pulse input/Contact input x 1*	—
Output			Power use pulse output/* Alarm output x 1	—
Display			Main unit LCD screen	Display unit sold separately
Logging function			Enabled by combination with logging unit (option)	Enabled by combination with logging display unit (option)
Compliance with foreign standards			UL, CE and South Korea Radio Wave Act * UL regulations compliance is scheduled to be acquired.	—

*Depending on the model, phase wires and settings.

Note: The above table is a simple comparison chart for the EcoMonitor series. Refer to each model catalog and operation manual for detailed information.

■EcoMonitorLight Measuring Unit

▶Model Name and Specifications of EcoMonitorLight Measuring Unit

Product Name	Unit	Specifications
Energy Measuring Unit : High Performance Model	EMU4-HD1-MB	Measures various energy items (such as current, voltage, power, power use and harmonics). Standard-equipped with MODBUS® RTU (RS485), Pulse and Contact input and output, Compatible with three-phase 4-wire.
Energy Measuring Unit : Standard Model	EMU4-BD1-MB	Measures various energy items (such as current, voltage, power and electric energy). Standard-equipped with MODBUS® RTU (RS485).

▶EcoMonitorLight Optional Equipment

Product Name	Unit	Specifications
Logging unit	EMU4-LM	Saves measurement data of the main unit of the energy measuring unit for a certain period of time. Outputs to SD memory card in CSV format.
CC-Link communication unit	EMU4-CM-C	Connects the main unit of the energy measuring unit with CC-Link communication.
SD memory card for logging unit	EMU4-SD2GB	SD memory card for use with a logging unit. Periodically saves data output from the logging unit.
Lithium battery for logging unit	EMU4-BT	Backup battery of a logging unit.
Board-installation attachment	EMU4-PAT	Attachment for installing to the board of a measuring unit, Used to cover the fixing screws when installing to a board.

▶Split-type Current Sensor/Cable

Product Name	Unit	Specifications
Split-type current sensor	EMU-CT50	50A (Only for low voltage)
	EMU-CT100	100A (Only for low voltage)
	EMU-CT250	250A (Only for low voltage)
	EMU-CT400	400A (Only for low voltage)
	EMU-CT600	600A (Only for low voltage)
	EMU2-CT5	5A*1 (Only for low voltage)
	EMU2-CT5-4W	5A*1 (High and low voltage for the secondary side for 5A CT, three-phase 4-wire)
5A current sensor cable	EMU2-CB-Q5B	Used if connecting EMU2-CT5-4W and EcoMonitorLight.
	EMU2-CB-Q5B-4W	three-phase 4-wire
Extension cable (standard type)	EMU2-CB-T1M	Used if extending EMU2-CT5 (-4W) and EMU2-CB-Q5B (-4W).
	EMU2-CB-T5M	
	EMU2-CB-T10M	
Extension cable (separate type)	EMU2-CB-T1MS	Used if extending the split CT of an EMU2-CT5 (-4W) and split sections, or if extending the cable between an EMU2-CT5-4W and the main unit of an energy measuring unit.
	EMU2-CB-T5MS	
	EMU2-CB-T10MS	

1: If measuring a high-voltage circuit or using an already installed CT, configuration is two-step with a 5A split current sensor connected to the secondary side of the CT (/5 A).

Precautions for Operating Environment and Conditions for Use

●This unit is premised on being used in a pollution degree 2*1 environment. Protect this unit from pollution on the side where another device is to be assembled when using in an environment with a different pollution degree.

●The measurement category of the measuring circuit in this unit is CAT II*1 and the energization voltage category of the auxiliary power circuit (MA and MB) is also CAT II.

●Do not use this product in the types of locations listed below. Use in such locations can result in malfunctions and decreased product life.

- The ambient temperature exceeds the operating range temperature (-5 to +55 °C).
- The relative humidity exceeds the operating range (30-85% RH) or the place where condensation occurs.
- There are large amounts of dust, corrosive gas, saline or oily smoke.
- Exposed to rain or water drops.
- Metal fragments or conductive substance are scattered.
- The average daily temperature exceeds 35 °C.
- There is excessive vibration or impacts.
- Exposed to direct sunlight.
- There is a strong electromagnetic field or there are large amounts of external noise.
- The altitude exceeds 2,000 m.

<Protection against Electric Shock>

●This unit is an open type device, meaning that it is designed to be housed within another device in order to prevent electric shock. Be sure to always house this unit within another device such as a grounded control panel before use.

●It is necessary to implement either of the following measures for the control panel in order to protect persons lacking sufficient knowledge about electrical equipment from electric shock.

- Lock the panel so that only those who have been trained and have sufficient knowledge about electrical equipment can unlock the control panel, or structure the control panel so that the power supply is automatically turned off when the panel is opened.
- Cover the sections of this module having dangerous voltage. (Required protection code is IP2X or higher.)

*1 : Refer to EN61010-1/2010 for the definition of pollution degrees and measurement categories.

Precautions for Pre-operation Preparation

●Be sure that the installation location complies with operating environment and use conditions.

●Be sure to specify the phase wire system, and primary voltage and current for each sensor type before operation.

Precautions for Installation and Connection

Be sure to always read the operation manual before installation and connection.

⚠ CAUTION

<Electrical Work Precautions>

●All installation and connection work must be performed correctly by technicians having specialized knowledge in matters such as electrical construction and wiring.

●Perform all installation and wiring work with the power turned off (no parts are energized) and do not perform live-wire work. Failure to do so can result in electric shock, and equipment malfunction or fire.

●Be very careful when creating screw holes or performing wiring so that no foreign material such as chips or cut wire ends get into the unit.

●Thoroughly check the connection diagram when wiring. Improper wiring can result in unit malfunction, or fire or electric shock.

●Do not place transmission or input/output signal wires **close to or bound together with power or high-voltage lines** in order to prevent noise interference.

●Always be sure to place wires to be connected to this module in a duct or clamp wires together to secure them. Failure to secure wires can result in electric wires moving due to looseness or unexpected stretching that causes module breakage or malfunction due to poor wire connections.

●If installing transmission or input/output signal wires next to power and high-voltage lines, maintain the separation distance shown in below table.

Item	Distance
Power lines of 600 V or less	300 mm or more
Other power lines	600 mm or more

<Types of Terminal Blocks>

●Strip wires to the proper length. Excessively long stripping length can result in a short circuit with neighboring wires. Excessively short stripping length can result in poor wiring connections and contact failure.

●Be careful not to cause a short circuit with a nearby pole due to the filament of a core wire. (Do not plate core wires with solder.)

●Do not connect three or more signal wires to one terminal of a terminal block. Doing so can result in weak clamping and wire disconnection.

●Use appropriate sizes of electric wires. Use of an inappropriate size can result in fire due to heat generation.

●Use overcurrent prevention devices (such as a fuse or circuit breaker) for circuits with wires connected to an auxiliary power circuit (MA or MB) in order to prevent short circuiting of connected power wires. (Select an appropriate rating in order to prevent fusing of wires.)

●Tighten screws to the specified torque. Excessive tightening can damage the screw and terminal.

●After tightening the screws, be sure to check that you have not forgotten to tighten a screw. A loose screw can result in module malfunction, fire or electric shock.

●Be sure to attach the terminal cover in order to prevent electric shock.

●Do not directly touch any energized part or terminals of the module. Doing so can result in electric shock, or module failure or malfunction.

●Do not pull wiring parts by hand when removing wires connected to this unit. Pulling on wires still connected to this unit can result in module or wiring damage.

<Connection with Current Sensor>

- Always be sure to use this unit in combination with a dedicated current sensor (EMU-CT50, EMU-CT100, EMU-CT250, EMU-CT400, EMU-CT600, EMU2-CT5, or EMU2-CT5-4W). This unit cannot be directly connected to the secondary side (5 A) of a current transformer. Do not use a current sensor input that exceeds the corresponding rating of this unit. Refer to the current sensor operation manual in order to maintain the functionality and accuracy of this unit.
- A dedicated current sensor (EMU-CT50, EMU-CT100, EMU-CT250, EMU-CT400 or EMU-CT600) is only used for low-voltage circuits. It cannot be used for a high-voltage circuit. Use EMU2-CT5 or CT5-4W transfixed to the secondary side (5A) of transformer. Connecting with a high-voltage circuit by mistake is extremely dangerous and can cause unit burnout or fire. Refer to “Specifications: Options (Split Current and 5A Current Sensors)” on p. 26 for maximum voltages that can be used with current sensors.
- Dedicated current sensors have a given polarity (directionality). Be careful to install in the proper polarity.

<Connecting with Frame GND Terminal>

- Do not exceed the range of specified voltage values when performing insulation resistance or commercial frequency withstand voltage tests. Do not connect the frame GND terminal to ground when performing such tests.
- Ground the frame GND terminal according to actual conditions of use. Use a D-type ground connection (ground resistance is 100 Ω or less).
- Use a crimp-type terminal appropriate for the size of electric wires. Use of an inappropriate crimp-type terminal can result in wire breakage or contact failure that causes module malfunction, failure, burnout or fire.

Precautions Regarding Use

- This unit cannot be used for transactions or proof of power use as stipulated by the Measurement Act.
- Before operating this module, thoroughly check that there are no energized bare wires or similar hazards nearby. If there are any exposed conductors or similar hazards, stop operation immediately and implement appropriate measures such as insulation protection.
- A power outage while specify settings will result in such settings not being properly set. Specify the settings again after power has been restored.

⚠ DANGER

- Do not touch live part. Doing so can result in electric shock, electric burn injury and equipment damage.
- Do not perform installation or wiring with equipment energized and do not perform live wire work.

⚠ CAUTION

- Do not touch charged parts. Doing so can result in electric shock, electric burn injury and equipment damage.
- Use within the rating ranges indicated in this manual. Using outside of the rating ranges can not only result in misoperation or equipment malfunction but can also cause fire or burnout.

Precautions for Maintenance and Inspection

- Wipe off surfaces using a soft cloth. Do not allow any type of chemical cloth to remain touching the unit for an extended period, and do not use benzene, thinner or similar chemicals for cleaning.
- Check for the following items in order to ensure proper operation and long product life of this unit.

(1) Daily Inspection
①No damage to the unit
②LED and LCD screens are operating properly.
③There are no abnormal noises, odor, heat generationor similar problems.

(2) Periodic Inspection
Inspect the following items from every six months to one year.
・There is no looseness in installation or wiring connections of terminals.

⚠ CAUTION	Always be sure to perform periodic inspection with all power turned off. Failure to do so can result in electric shock, equipment malfunction or fire. Periodically tighten terminals. Failure to do so can result in fire.

Precautions for Storage

- Before storage, turn off the power, remove wires, and place the unit in a plastic bag.
- Do not store the module in the types of locations described below when storing for an extended period. Storing in such places can result in malfunction and reduced service life.
  - ・The ambient temperature exceeds the storage range temperature (-10 to +60 °C).
  - ・The average daily temperature exceeds 35 °C.
  - ・There is excessive vibration or impacts.
  - ・Metal fragments or conductive substance are scattered.
  - ・The relative humidity exceeds the humidity range (30-85% RH).
  - ・There are large amounts of dust, corrosive gas, saline or oily smoke.
  - ・Exposed to rain, water drops or direct sunlight.

Precautions for Disposal

- Properly dispose of this unit in accordance with the Waste Disposal and Public Cleansing Act.

About disposal of the battery

- When the lithium battery is built in, please process the lithium battery in accordance with the rule of cities, towns and villages.

⚠ CAUTION	The removed lithium battery has a possibility that electric power capacity remains. Since there is a possibility of contacting other metal, and generating heat, exploding and igniting, please manage individually.

About Packaging Materials and Operation Manual

- Packaging materials are made of cardboard and the operation manual is printed on recycled paper in order to reduce the load on the environment.

*Refer to the operation manual (Detailed Version) for details.

Memo

Memo

Energy Measuring Unit Eco Monitor Light

Service Network

Country / Region	Company	Address	Telephone
Australia	Mitsubishi Electric Australia Pty. Ltd.	348 Victoria Road, Rydalmere, N.S.W. 2116, Australia	+61-2-9684-7777
USA	Mitsubishi Electric Automation Inc.	500 Corporate Woods Parkway Vernon Hills, IL 60061, USA	+1-847-478-2100
Brazil	MELCO-TEC Rep. Com. e Assessoria Tecnica Ltda.	Av. Paulista, 1439-Cj.72, Cerqueira Cesar CEP 01311-200, Sao Paulo, SP, CEP:01311-200, Brazil	+55-11-3146-2200
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India	Mitlite Electric Company Pvt Ltd	Plot No-32, Sector-6, IMT Maneser,	+91-124-4695300
Indonesia	P. T. Sahabat Indonesia	P.O.Box 5045 Kawasan Industri Pergudangan, Jakarta, Indonesia	+62-(0)21-6610651-9
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Laos	Societe Lao Import Co., Ltd.	43-47 Lane Xang Road P.O. BOX 2789 VT Vientiane Laos	+856-21-215043
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Malaysia	Mittric Sdn Bhd	5 Jalan Pemberita U1/49, Temasya Industrial Park, Glenmarie 40150 Shah Alam, Selangor, Malaysia	+603-5569-3748
Myanmar	Peace Myanmar Electric Co.,Ltd.	NO137/139 Botataung Pagoda Road, Botataung Town Ship 11161, Yangon, Myanmar	+95-(0)1-202589
Nepal	Watt & Volt House	KHA 2-65, Volt House Dillibazar Post Box: 2108, Kathmandu, Nepal	+977-1-4411330
Middle East Arab Countries & Cyprus	Comptoir d'Electricite Generale-International-S.A.L.	Cebaco Center - Block A Autostrade Dora P.O. Box 11-1314 Beirut - Lebanon	+961-1-240430
Pakistan	Prince Electric Co.	1&16 Brandreth Road, Lahore-54000, Pakistan	+92-(0)42-7654342
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South Africa	CBI-electric: low voltage	Private Bag 2016, Isando, 1600, South Africa	+27-(0)11-9282000
Taiwan	Setsuyo Enterprise Co., Ltd	6th Fl., No.105, Wu Kung 3rd, Wu-Ku Hsiang, Taipei, Taiwan, R.O.C.	+886-(0)2-2298-8889
Thailand	United Trading & Import Co., Ltd.	77/12 Bamrungmuang Road, Klong Mahanak, Pomprab Bangkok Thailand	+66-223-4220-3
Uruguay	Fierro Vignoli S.A.	Avda. Uruguay 1274, Montevideo, Uruguay	+598-2-902-0808
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Vietnam	CTY TNHH-TM SA GIANG	10th Floor, Room 1006-1007, 255 Tran Hung Dao St., Co Giang Ward, Dist 1, Ho Chi Minh City, Vietnam	+84-8-8386727/28/29

For Safety : Please read the instruction manual carefully before using the products in this catalog. Wiring and connection must be done by the person who has specialized knowledge of electric construction and wirings.

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eco Changes for a greener tomorrow

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.

MITSUBISHI ELECTRIC CORPORATION

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